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FERTILIZING AND CLIPPING EFFECTS ON SEED
CAPSULE AND FORAGE PRODUCTION OF ORANGE GLOBEMALLOW¹

Clay Gautier and Richard Everett²

ABSTRACT

Seed of orange globemallow (*Sphaeralcea munroana*), a forb native to western rangelands, is not readily available because of variability in wildland seed crops. Seed of this forage and reclamation species must be raised under cropland conditions if a dependable seed supply is to be developed. Effects of fertilizers and clipping on seed capsule and biomass production were investigated in a lathhouse study. Clipping extended the flowering period and stimulated vegetative growth. Fertilizing plants in early flower stages and after clipping increased both seed capsule and biomass production. Only plants clipped after seed set produced a second crop of seed capsules.

KEYWORDS: seed production, native forb, globemallow, clipping effects

Orange globemallow (*Sphaeralcea munroana*), a perennial forb, is a forage species for wildlife and livestock on many western ranges (USDA Forest Service 1966, 1969) (fig. 1). Globemallow rapidly occupies disturbed areas and should be useful in reclamation work. Its showy scarlet flowers may also make the species useful in horticulture.

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²The authors are respectively biological technician and range scientist located at the Renewable Resources Center, University of Nevada, Reno.

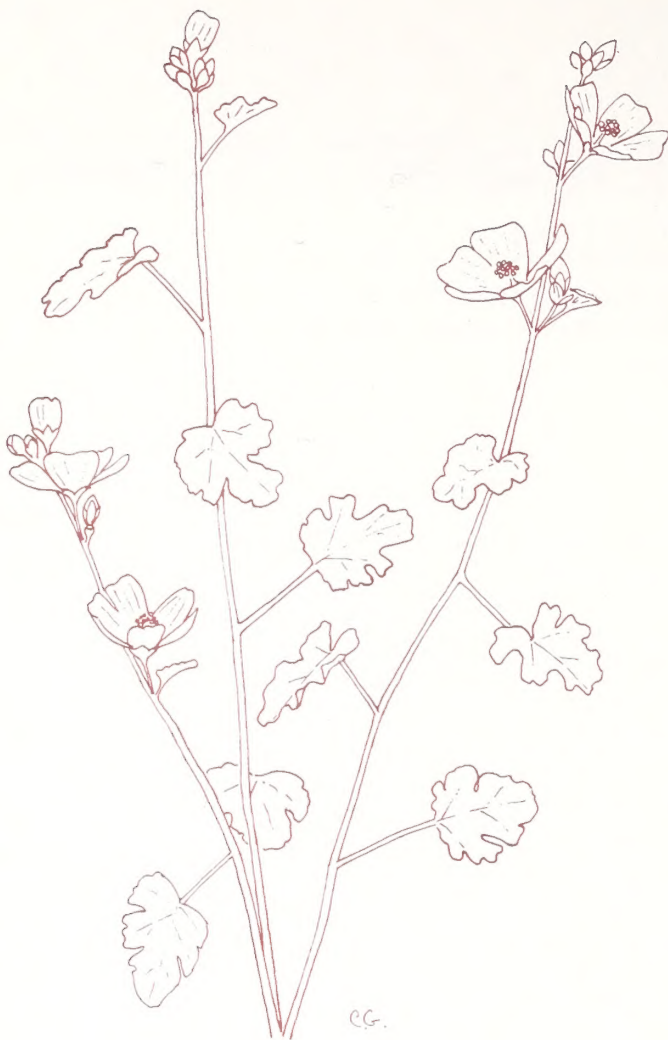


Figure 1.--Orange globemallow in flower (blooms are scarlet).

Seed of globemallow is rarely available. Nearly all seed is presently collected from wildland stands. Variability in wildland seed crops and high costs of seed collection add to the problem. Globemallow seed must be produced under cropland conditions before seed will be reasonably priced.

Cropland seed production of native forbs is still in its infancy and fertilizer requirements for maximum seed production of many wildland species, including globemallow, are unknown. Investigators have found that fertilizers increase the seed production of many plant species. Of the three major nutrients, nitrogen, phosphorus, and potassium (N,P,K), nitrogen has been reported to be the most effective (Williams and Smith 1954; Hawthorn 1952). Phosphorous fertilizer is less consistent than nitrogen in increasing seed production among crops (Schudel 1952) and potassium fertilizer has resulted in few increases in seed production.

Field observations of orange globemallow indicate that flowering and seed capsule production may be correlated to the number of flowering stems produced. Clipping chrysanthemums, which have a growth form similar to globemallow, increases branching and flowering (Laurie and others 1968). We wondered if globemallow would respond similarly.

In this study, we attempted to determine the effects of fertilizers (N-P) and clipping on seed capsule and forage (biomass) production of first year globemallow plants.

METHODS

Globemallow plants, raised from seed collected at a single site, were grown for 3 months in a greenhouse until flowerbuds started to form. Plants then were screened for uniform size and vigor and moved to a lathhouse. Plants were grown in deep, paper pot containers (5 by 5 by 30 cm) filled with a loamy sand soil, low in nitrogen and phosphorus.

Three clipping treatments were tested. Plants were either (1) not clipped, (2) clipped in early flowering stages (July 1, 1977), or (3) clipped after seed ripening (August 1, 1977). Dates in parentheses are the dates of the treatments. Leaves and stems were removed to a stubble height of 5 cm when plants were clipped.

Fertilizer treatments tested in conjunction with clipping treatments and the application dates were as follows:

1. Plants fertilized in early flowering stages (June 17, 1977).
2. Plants fertilized immediately after clipping (early flower stage, July 1, 1977; or after seed ripe, August 1, 1977).
3. Plants fertilized in early flowering stages and after either clipping treatment.
4. Plants not fertilized.

Fertilizer was applied at a rate of approximately 100 kg/ha of actual nitrogen in the form of soluble urea ($\text{CO}(\text{NH}_2)_2$) and 50 kg/ha of actual phosphorus in the form of soluble sodium hypophosphate ($\text{NaH}_2\text{PO}_4 \cdot \text{H}_2\text{O}$). Each plant received 2 ml of solution containing 0.056 g urea and 0.063 g sodium hypophosphate each time a fertilizer treatment was applied. All plants received similar amounts of water and light.

The tabulation below shows the combined clipping-fertilizer treatments tested and the number of replicates in each treatment. Replications, each containing 16 plants, were located randomly throughout the lathhouse. Clipping and fertilizer treatments tested were:

<i>Treatments</i>	<i>Number of Replications</i>
<i>Not Clipped</i>	
Not fertilized	8
Fertilized in early flowering stages	8
<i>Clipped in early flowering stages</i>	
Not fertilized	8
Fertilized in early flowering stages	8
Fertilized after clipping	8
Fertilized in early flowering stage and after clipping	8
<i>Clipped after seed set</i>	
Fertilized after clipping	4
Fertilized in early flowering stages and after clipping	4

Green weight of foliage and of stems was recorded at clipping time for both clipping treatments. Green weight was also recorded on September 28, when all treatments were "harvested" down to a 2-cm stubble height. We considered green weight to be an adequate measure of relative forage production among treatments because all plants were grown under a constant moisture regimen.

Ripe seed capsules were collected by hand once a week. Actual seed production was not measured because some capsules shed seed before they could be collected.

A one-way analysis of variance test was used to analyze the data. Duncan's multiple range test was used for individual comparisons when F values were significant at the 0.05 level.

RESULTS

Unclipped plants had a flowering sequence similar to plants growing in natural stands. Plants developed flower stalks in late May and completed seed ripening by late July. Growth of unclipped plants ceased when flowering stopped.

Clipped plants had an extended flowering period. Plants clipped in early flowering stages continued flowering through September. Plants clipped after seed set flowered through October and produced a second seed crop. Plants began to flower about 4 weeks after clipping.

Clipping stimulated vegetative growth and, in conjunction with applied fertilizer, substantially increased total plant biomass. Total forage production was greatest in plants fertilized in early flowering stages and after clipping tables. Clipped plants continued to grow until the first hard frosts.

Total seed capsule production was greatest on plants clipped after seed set and fertilized both in early flowering stages and after clipping (table 1). Clipping in early flowering stages reduced the number of seed capsules harvested because flowerbuds removed were not replaced by the plant. Ratliff and Hubard (1975) reported a similar decrease in seed production when California poppy (*Eschscholzie californica*) was clipped in early flowering stages.

Applying N-P fertilizer increased seed capsule production of both unclipped plants and plants clipped after seed set. Fertilizing plants before clipping in the early flowering stages appeared to only increase the number of flowerbuds removed by early clipping and lower the number of seed capsules harvested at a later date.

Plants achieved good initial growth when fertilized. Fertilization after clipping also increased the plant's potential for regrowth. Unfertilized plants produced the least biomass and the fewest seed capsules.

Table 1.--Seasonal totals for seed capsule and forage production of orange globemallow under various fertilizer and clipping treatments

Treatment	Seed capsules	Forage (g)
<i>Not clipped</i>		
Not fertilized	^{1,2} 37.5bc	³ 3c
Fertilized in early flowering stages	53.5ab	8.25bc
<i>Clipped in early flowering stages</i>		
Not fertilized	.75d	4.63c
Fertilized in early flowering stages	2.38d	25a
Fertilized after clipping	15.63cd	16.38b
Fertilized in early flowering stages and after clipping	9.5cd	36.63a
<i>Clipped after seed set</i>		
Fertilized after clipping	24.25bcd	14bc
Fertilized in early flowering stages and after clipping	76.5a	28.75a

¹Mean number of capsules produced per replicate (16 plants).

²Values with dissimilar superscripts are significantly different at the 0.05 level.

³Mean forage weight produced per replicate (16 plants).

CONCLUSIONS

Clipping orange globemallow after seed set has potential for increasing seed capsule and forage production. Second seed crops are possible only on clipped plants. If soils are deficient in nitrogen or phosphorus, these elements must be provided if maximum seed capsule and forage production are to occur.

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